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No. 19

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# FOREWORD

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ATTEMPTING TO IDENTIFY  
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UNITED STATES DEPARTMENT OF COMMERCE  
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SOVIET AGRICULTURE

No. 19

Selected Translations on Farm Machinery Plants

[Following is a translation of selected articles from the Russian-language periodical Mashino-stroitel' (Machine Builder), Moscow, No. 2, February 1960. Page and author are given under individual article headings.]

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## I. METAL CERAMICS AND CARBON IN FRICTION UNITS OF AGRICULTURAL MACHINES

Pages 31-32

V. S. Kreshchik,  
O. G. Klimenko, and  
A. V. Tiratsuyan,  
engineers of the  
Central Plant Laboratory

In friction units of different machines bronze and Babbitt metal anti-friction bearings, either ball bearings or roller bearings, are employed. Manufacturing these bearings from light anti-friction alloys entails large losses of metal during mechanical processing. This raises the cost of bearings. Ball bearings and roller bearings are expensive and difficult to manufacture.

Workers of the Rostov Agricultural Machinery Plant--Rostsel'mash--in cooperation with the Rostov Institute of Agricultural Machine Building, have under taken the manufacture of metal ceramic bearings, to be used in place of bearings made of light alloys.

The technique of manufacturing porous iron graphite bearings adopted by the plant is described below. Sifted ferrous powder is tempered at  $700^{\circ}\text{C}$ . in a hydrogen medium for one hour, then the tempered powder is sifted and schistose materials are added. After this the mixture is stirred in a mixing machine for 4 hours. Then further stirring (from 0.5 to one hour) is carried out while adding machine oil in an amount of one percent of the weight of the schist. The next operation is manufacture of bushings with hydraulic, unilateral-action pressing machines with a specific pressure up to  $5,000\text{ kg/cm}^2$ . Then the bushings are baked in ground charcoal at a temperature of  $1,050\text{--}1,000^{\circ}$  for 6 hours. The baked bushings are soaked with L machine oil at a temperature of  $120^{\circ}$  for one to two hours, and then calibrated.

In this way metal ceramic bearings were manufactured for friction units of the SK-3 combine. The composition of the ceramic material was 97 percent ChMTU 3548-53, type AM ferrous powder and 3 percent colloidal graphite.

Metal ceramic bushings were installed on pulleys and sprocket wheels in place of ball bearings (figure one), simplifying the design of these units. The friction parts were greased during assembly of the unit instead of during operation. A combine with metal ceramic bearings was tested under field conditions, harvesting 169 hectares of crops. On the basis of experiments the Central State Machine Testing Station recommended mass production of these bearings.

Practice has shown that metal ceramic bearings have better anti-friction qualities than ordinary anti-friction bearings. It is possible to replace ball bearings by metal ceramic bearings in many cases. The cost of iron graphite bearings is 2 to 3 times lower than that of ball bearings, a factor contributing to cost reduction in manufacture of machinery.

As well as inaugurating the production of metal ceramic bearings, the Central Plant Laboratory of Rostsel'mash, utilizing the studies of the Kommunar Plant at Zaporozh'ye and the Forging-Pressing Equipment Plant at Taganrog, undertook in 1959 a study of practical application of capron castings for the manufacture of parts of friction units.

An automatic furnace was built at the plant for casting thermoplastic material under pressure (figure 2). This capron smelting furnace is arranged as follows: A cylinder 1 (one) for smelting is made from a used oxygen tank.

On the cylinder is screwed a cover 2 with three apertures for pipes 3 with heating coils 4. The bottom 8 and the cover 2 serve as supports for the jacket 5.

The entire space between jacket and cylinder 1 (one) is filled with oil. During smelting excess nitrogen pressure is maintained in the cylinder. The faucet shank 6 must be grounded down. A disk 7 is designed for mounting an electrical coil keeping the faucet temperature at a level of  $250^{\circ}$ .

To control the temperature of smelting two thermostats are mounted on the automatic furnace. One serves to hold constant the temperature of the upper layer of oil and is connected to an automatic potentiometer, while the second thermostat is connected to a galvanometer and is used to hold constant the temperature of the capron material. A thermometer is used for watching the temperature of the bottom layers of oil.

To reduce heat losses a sheet iron sheath is installed, and the space between the jacket and the sheathing is insulated.

Textile manufacturing capron wastes are cleaned of cotton and other matter and freed of grease by boiling in a solution. Then the capron mass is rinsed. After this it is wrung out and dried, at first at room temperature, then in drying chambers until the moisture is completely removed (for about 18 to 20 hours). Then the capron is loaded into the automatic furnace and is smelted under nitrogen pressure of 10 atmospheres. Casting is done at a temperature of  $240-260^{\circ}$ . The cast parts are removed from the press molds in a warm state and boiled in water.

Capron bushings were installed in 30 serially-produced combine pickups, which were tested in different places of the country. For experimental reasons capron bushings were installed on one of the eccentric presses of the cold punching shop. They were in operation from October 1958 to April 1959. The results were satisfactory.

Preliminary calculations show an annual saving of over 5 million rubles as a result of use of capron bearings instead of bushings made of tempered pig iron and ball bearings.

Furthermore, capron can be used in place of bronze bearings on presses with a capacity of 50 and 80 tons. On repair work on the plant's pressing machines it should be possible to save no less than 12.8 tons of bronze, costing 150,000 rubles. If one considers the economies produced as a result of reducing the number of stand-stills of equipment and, consequently, the amount of time spent on repair work, this amount would be even greater.

**FIGURE APPENDIX**

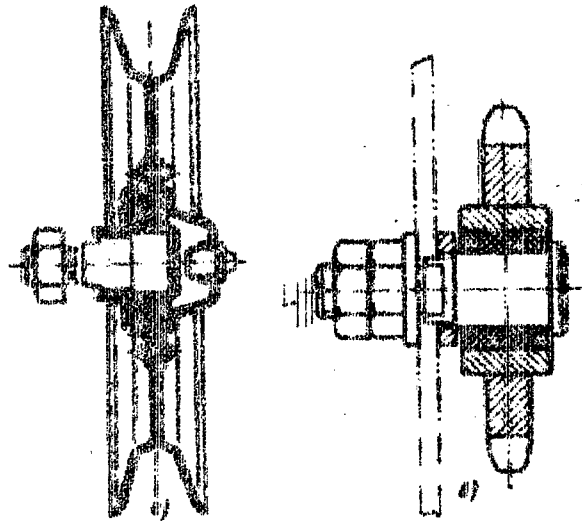


Figure 1. Design of friction units:

a—with ball bearings; b—with a metal ceramic bushing.

U.S. PATENT OFFICE

1940

Patented

June 11, 1940

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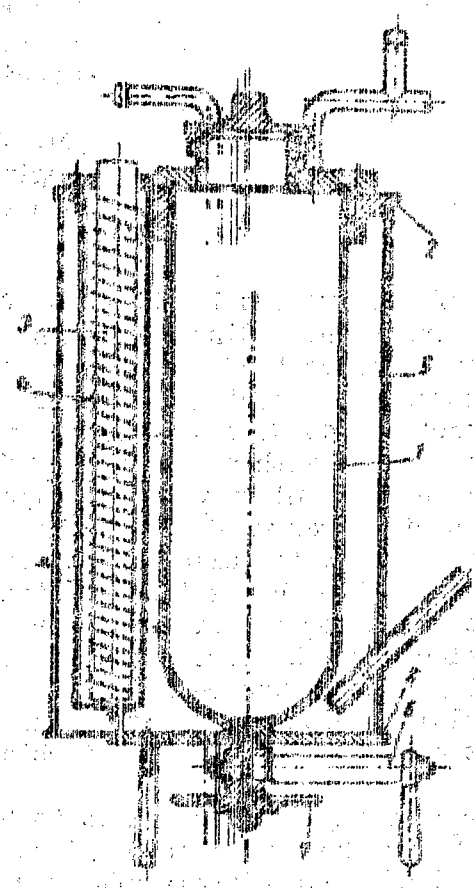


Figure 2. Automatic furnace for preparation of capron material.



## II. THE USE OF PLASTICS IN AGRICULTURAL MACHINE BUILDING

Page 33

R. I. Frenkel',  
director of the chemical  
department of the Central  
Plant Laboratory of the  
Rostov Agricultural  
Machinery Plant  
and  
Yu. Ye. Val'vachev,  
engineer in the  
Central Laboratory

A great amount of wood wastes in the form of shavings and sawdust is produced at our plant. Since the plant processes mainly beechwood, no more than 10 percent of shavings consist of soft woods. This has suggested the use of wood wastes for manufacturing plastics. A special section was organized in the woodworking shop, in which two hydraulic presses with a capacity of 50 and 10 tons, a small boiler and a mechanical mixer were installed.

Formerly, this section was used for the manufacture of boards and door panels for private building, but this was economically inefficient. Then the section was transferred to the Central Plant Laboratory for experimental work. The mixer was equipped with an electrical heater, sawdust screening was mechanized, and a drying chamber was built. Preparations were made to manufacture molding powder and plastic parts for combines.

The section was equipped for boiling pitch and lacquer resins.

When the powder is ready the press mold is heated to a temperature of 140-150° and the powder is put into the matrix. The press mold is closed and, immediately afterwards, premolding is carried out, in order to remove volatile substances and prevent the appearance of bubbles. During processing of the powder a pressure of 450-500 kg/cm<sup>2</sup> is maintained for 3 to 8 minutes, depending on the thickness of the cast.<sup>1</sup> [see note] (In enterprises specializing in the production of plastics a more intensive method of molding is employed.)

In molding, the lacquer resin press powder is kept at a pressure of 200-250 kg/cm<sup>2</sup> with a temperature of 140-150°C. The molded item is cooled and cleaned.

The forms manufactured in the plant were subjected to mechanical testing with a GOST 5689-51 machine. The results were satisfactory. In some ways these forms were found to be superior to standard phenol plastic items.

The results of mechanical testing led to a decision to manufacture several parts of the SK-3 combine from plastic molding powder and test them under field conditions. These parts consisted, in particular, of housings, body opening lids, and the gas tank cover. In addition, the pulleys of the threshing apparatus and pickup were made of fiber plastic with the addition of molding powder created in the laboratory.

Over 100 plastic pulleys were tested on a stand under a horsepower of 18 and an rpm. of 900 for 1.5 hours. On a combine this same pulley operates under 12 horsepower at 760 rpm. No breaks or other wearing defects occurred.

At present over 30 combines equipped with plastic parts have been tested under field conditions. First results of the tests are positive.

This work is of practical significance, since replacing only 86 metal and wooden combine parts by plastic parts would yield a saving of 148,000 rubles for every thousand machines.

A no less important factor is the large reduction in weight of the combine, as the weight of the plastic parts is three to five times lower than that of metal parts.

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- END -